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ABSTRACT

A quasi-experimental, pretest/posttest, treatment group/control group design was used to test the effectiveness of 36 entrepreneurship modules. The field test design featured multiple replications at sites across the country. Participating students were enrolled in various types of secondary vocational schools and programs and experienced various instructional arrangements and methods of teaching. The field test was conducted under a variety of conditions. Several criteria were used in selecting sites at which to field test the modules. These criteria included (1) the site's interest in implementing the entrepreneurship modules; (2) sufficient enrollment so that a number of business-specific modules could be tested at each site; (3) willingness to meet evaluation design specifications; and (4) geographical location. The modules were used in both regular vocational instruction and in cooperative education classes. Both treatment and control groups had approximately equal proportions of males and females. At all sites, the modules were taught by regularly employed vocational instructors, and modules were taught as part of the regular classwork. A test with 30 multiple-choice items was used in the field test. Modules were found to be low in cost and teachers found them to be generally valuable and easy to use. (CT)

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Synthesis of Field Test Findings

Thirty-six Entrepreneurship Training Components were developed for use in secondary-level vocational courses by American Institutes for Research (AIR). The instructional modules were developed during the first year of a two-year project funded by the U.S. Department of Education's Office of Vocational and Adult Education. The modules were field tested during the 1980-81 school year at 24 secondary settings in 16 states across the country. Field test sites are listed below.

1. State of Rhode Island
   (2 regional vocational centers)
2. Oswego County BOCES
   Mexico, NY
3. Gloucester Co. Vocational-Technical School
   Sewell, NJ
4. Central Westmoreland Area Vocational-Technical School
   New Stanton, PA
5. School District of Philadelphia
   Philadelphia, PA
6. Baltimore County Public Schools
   Towson, MD
7. West Craven High School
   Vanceboro, NC
8. Newaygo County Area Vocational Center
   Fremont, MI
9. Winston County Area Vocational-Technical School
   Double Springs, AL
10. Albert P. Brewer High School and Vocational School
    Somerville, AL
11. Central High School
    Little Rock, AR
12. Jefferson Parish Public Schools
    Jefferson, LA
13. State of Oklahoma
    (24 high schools and vocational centers)
14. Kiamichi Area Vocational-Technical Facility
    McAlester, OK
15. Kirbyville Consolidated Independent School District
    Kirbyville, TX
16. Austin Independent School District
    Austin, TX
17. Edcouch-Elsa Independent School District
    Edcouch, TX
18. North Dakota Industrial School
    Mandan, ND
19. Granite School District
    Salt Lake City, UT
20. Weber County School District
    Ogden, UT
21. Highline School District
    Seattle, WA
22. Issaquah School District
    Issaquah, WA
23. Fresno Unified School District
    Fresno, CA
24. Sequoia High School District
    San Carlos, CA

As the field test was drawing to a close, AIR project staff made a preliminary assessment regarding the field test sites whose data would be included in the evaluation report to be submitted to the Department of Education's Joint Dissemination Review Panel. This assessment was based on the completeness of

evaluation data submitted and the fidelity with which the entrepreneurship modules were implemented. Data from 14 of the 24 field test sites were ultimately included in the project's JDRP submission. The most common reason for excluding a site from the sample was lack of evaluation documentation--i.e., project staff did not receive pre- and posttests for both the treatment and control students at a particular site. In one instance the control group was a biology class rather than a vocational class; this site was eliminated, since project staff felt that a valid comparison group had not been used. In other cases there were barriers beyond the control of either AIR or local site staff; an example of this sort is a site where school personnel went on strike.

The evaluation report that begins on the next page presents evidence of the modules' effectiveness at 14 sites whose field test data were analyzed.

EVIDENCE OF EFFECTIVENESS

A quasi-experimental, pretest/posttest, treatment group/control group design was used to test the effectiveness of the entrepreneurship modules. The field test design featured multiple replications at sites across the country. Participating students were enrolled in various types of secondary vocational schools and programs, and experienced various instructional arrangements and methods of teaching. The field test was conducted under a variety of conditions representing those in which the modules will actually be used.

Field Test Sites and Participants

Several criteria were used in selecting sites at which to field test the entrepreneurship modules. These criteria included: (1) the site's interest in implementing the entrepreneurship modules; (2) sufficient enrollment so that a number of business-specific modules could be tested at each site; (3) willingness to meet evaluation design specifications; and (4) geographical location.

Nominations of potential sites were solicited from all 57 State Liaison Representatives of the National Network for Curriculum Coordination in Vocational-Technical Education; a total of 88 nominations was received. The nominated sites were contacted to inform them of their nomination and to discuss AIR's guidelines for participation in the field test. Requirements for participation were the following: (1) a coordinator be assigned responsibility for field test duties; (2) two modules (the core module and one business-specific module) be taught to approximately 18 students in a number of vocational classes; (3) a control group of about 18 students similar to the treatment students be selected; (4) the pretest/posttest be administered to treatment students before and after they studied the modules and to the control group at about the same times; and (5) teachers who used the modules would complete an End-of-Module Questionnaire for each module they taught. The final 14 sites selected to participate in the field test demonstrated their agreement and commitment to participate by completing a form indicating demographic characteristics of the site, a date for conducting on-site training regarding field test requirements, and which business-specific modules could be taught at the site.

As shown in Table 1, the 14 entrepreneurship field test sites that were ultimately selected included high schools, regional vocational centers, and a secondary correctional school. Five sites were located in the east, three in the south, and six in the west. There were four urban sites, six suburban sites, and four rural sites. The type of institution (e.g., comprehensive high school) was the same for both treatment and control groups at each site.

A local coordinator at each site identified instructors and students to serve in the treatment and control groups. A project staff member conducted a half-day orientation session at each site prior to the start of the field test. The orientation covered the value of entrepreneurship training for secondary vocational students, how the entrepreneurship skills list was developed, how the 35 businesses were selected, the module format, and the evaluation design. Instructions were given regarding pretest/posttest administration and the role of the local field test coordinator.

Table 1 shows the number of treatment group and control group students who participated in the field test at each site and the types of vocational courses in which they were enrolled. Since only one vocational class was identified as the control group for each site, students of <u>one</u> teacher at <u>one</u> school served as the control group for a particular site.

The modules were used in two types of vocational classes. They were used in regular vocational instruction in which students were learning technical skills. For example, students in auto mechanics worked on cars in the garage and worked on the entrepreneurship modules in the classroom. The materials were also used in cooperative education (coop) classes. Coop students studied the entrepreneurship modules as part of their on-campus curriculum and worked in paid employment in the afternoon. Class size varied, depending on the type of vocational class. Class sizes ranged from under 10 to over 30 students.

Both treatment and control groups had approximately equal proportions of males and females. Students' ages ranged from 14 to 19 years. The means of the ages of treatment group and control group students were 16.8 years and 16.7 years, respectively.

Table 1

FIELD TEST SITES AND PARTICIPANTS

Name and Location of School District	Setting	Type of Institution(s)	# of Schools (Treatment Group)	# of Teachers (Treatment Group)	Related Vocational Discipline (Treatment Group)	Related Vocational Discipline (Control Group)	Number of students (T group)	Number of students (C group)
EAST								
1. State of Rhode Island	Urban	Regional Vocational Centers	2	6	Ag, DE, Home Ec, T+I	T+I	62	14
2. Gloucester County Area Vocational-Technical School, Sewell, NJ	Suburban	Regional Vocational Center	1	6	Ag, Health, Home Ec, T+I	T+I	106	18
3. Central Westmoreland County Area Vocational-Technical School, New Stanton, PA	Suburban	Regional Vocational Center	1	9	Ag, DE Health, Home Ec, T+I	T+I	151	14
4. Baltimore County Public Schools, Towson, MD	Suburban	Comprehensive High Schools	10	12	Diversified Occupations	Diversified Occupations	282	15
5. Newaygo County Area Vocational Center, Fremont, MI	Rural	Regional Vocational Center	1	11	Ag, Bus + off, Home Ec, T+I	Bus + office	157	35
SOUTH								
6. Central High School, Little Rock, AR	Urban	Comprehensive High School	1	12	DE, Health, Bus + off, Home Ec, Industrial Coop. Training (ICT)	DE	147	14
7. Kirbyville Consolidated Independent School District, Kirbyville, TX	Rural	Comprehensive High School	1	5	DE, Home Ec, T+I	Bus + office	79	12
8. Austin Independent School District, Austin, TX	Urban	Comprehensive High Schools	7	11	DE, T+I, ICT	ICT	164	20
WEST								
9. North Dakota Industrial School, Mandan, ND	Rural	Juvenile Correctional Facility	1	5	Ag, Bus + off, Home Ec, T+I	Bus + off	19	18
10. Granite School District, Salt Lake City, UT	Urban	Comprehensive High Schools	5	8	DE, Bus + off, Home Ec	DE	10	7
11. Weber County School District, Ogden, UT	Suburban	Comprehensive High School	1	2	DE	Bus + off	23	16
12. Highline School District, Seattle, WA	Suburban	Comprehensive High Schools	2	2	DE	DE	33	16
13. Issaquah School District, Issaquah, WA	Rural	Comprehensive High School	1	1	Diversified Occupations	Home Ec	34	15
14. Sequoia High School District, Redwood City, CA	Suburban	Comprehensive High School	1	2	Bus + off	Bus + off	9	17
						TOTAL	1369	231 = 1600

Treatment

At all sites, the modules were taught by regularly-employed vocational instructors. Students who participated in the field test were not paid but completed the entrepreneurship modules as part of their regular coursework. Generally, modules were taught by teachers during class time, although some students used the modules on an independent study basis. In most cases, the core module and one particular business-specific module were studied by the whole class, but in some classes students selected different business-specific modules for study after completion of the core module. (This was the case particularly in coop classes, in which students selected a module related to their job placement.)

Since methods for infusing the modules into coursework and for teaching their content were not prescribed during the orientation sessions, instructors taught the modules in a variety of ways. Some teachers used a lecture method, basing class presentations on the case study and text sections. Other teachers displayed portions of the Student Guide on an overhead projector for total-class or small-group discussions. Instructors selected the learning activities most appropriate for their students and relevant to their local settings. Some instructors developed intermediate quizzes to supplement the final quiz contained in the module.

Treatment group students were exposed to the following: the pretest, the core module, one business-specific module, and the posttest. Control students took a pretest and a posttest. During the interim, control students received their regular vocational instruction--i.e., technical skills training or the cooperative education curriculum, depending on the type of class in which they were enrolled. Pretests and posttests were administered to the treatment and control groups at any one site at approximately the same times. Across sites, the pretest was given during the fall and winter of 1980, while the posttest was administered during the winter and spring of 1981.

Measurement of Effect

Since no standardized test existed to adequately estimate the effectiveness of the entrepreneurship modules, a test with 30 multiple-choice items was constructed specifically for use in the field test. The test provides information on the overall effect of studying the core module

and one business-specific module. It assesses knowledge of the skills that were identified by project staff as essential for success as a beginning entrepreneur and that served as the basis for developing the module goals and objectives. The same instrument was administered as a pretest and a posttest to both treatment and control groups.

The pretest/posttest was prepared according to a careful, step-by-step development process and was approved by the Federal Education Data Acquisition Council (FEDAC), the group charged with ensuring that data are collected by the most efficient and effective means. Forty-three four-option, multiple-choice items were written to test knowledge of skills presented in each unit of the core module. The module's author identified areas to be tested, and the items were written and reviewed for content validity by project staff. The project's evaluation director also reviewed the items for technical adequacy. Then the items were revised as many times as were necessary.

A total of 18 secondary vocational students who were participating in one of two training programs (construction and word processing) at a regional occupational center comprised the group that pilot tested the test items. Items were divided into two sets, and four or five students from each course answered each set. Pilot test students were also given an opportunity to critique the items. No comments indicating necessary revisions were received.

Using pilot test results, discrimination indices (point-biserial correlations) and difficulty levels were calculated for each item. Items with low discrimination indices or very high or low difficulty levels were removed from the item set to be included in the pretest/posttest until the final version contained two items directly related to content in each of the 15 units of the core module.

Validity. Because of the direct correspondence of test items to module content, the entrepreneurship pretest/posttest was judged to be a valid indicator of the effectiveness of the modules.

Reliability. A Spearman-Brown split-half estimate of the reliability of the entrepreneurship pretest/posttest was calculated using the pretest data of 85 treatment group students and 15 control group students chosen randomly from all those who participated in the field test. An

estimated reliability coefficient of .69 was obtained, which is relatively high for a 30-item test and certainly sufficient for making comparisons between groups, as was done in the entrepreneurship field test.

An attempt was made to ensure that scoring and analysis was done objectively and reliably. While the pretests and posttests were administered by the teachers of treatment and control students in their classrooms, the completed tests were sent directly to AIR for scoring. Tests were scored, and data were coded and keytaped by clerical staff who had little stake in the outcome of the field test. Considerable effort was spent on checking coding and keytaping to eliminate clerical errors. Computer services staff of AIR, rather than project staff, analyzed the data using standard statistical packages.

Evidence of Impact

The effect claimed for the entrepreneurship modules is cognitive and is based on the results obtained from administering the pretest/posttest comprised of multiple-choice items. The assertion of the effectiveness of the modules is based on the comparison of the pretest and posttest results of students who studied the modules and the comparison of these data with results obtained from an equivalent control group who did not study the modules. The test results of only those students who took both a pretest and a posttest (and for the treatment group, students who studied the two-module sequence) were included in the analyses.

T-tests for independent samples were used to compare pretest and posttest results of treatment and control group students. T-tests for correlated samples compared pretest with posttest results for both groups. The results of these analyses are shown in Table 2. While the mean test scores of both groups increased significantly from the pretest to the posttest, the treatment group's gain in mean score from the pretest to the posttest was greater than the gain of the control group. The difference between the mean scores of the treatment group and the control group on the pretest was not significant, while the difference between their posttest scores was significant at the .01 level.

Table 2

ENTREPRENEURSHIP FIELD TEST PRETEST AND POSTTEST RESULTS

	Status	N	Mean	Standard Deviation
Pretest Scores	Treatment Group	1369	17.26	4.13
	Control Group	231	17.53	4.00
Posttest Scores	Treatment Group	1369	19.96	4.82
	Control Group	231	18.91	4.65

T-Test Analyses

Comparison	T	Probability
Treatment Group Pretest vs. Treatment Group Posttest	25.41	<.0001
Treatment Group Posttest vs. Control Group Posttest	-3.08	<.01
Control Group Pretest vs. Control Group Posttest	5.38	<.0001
Treatment Group Pretest vs. Control Group Pretest	0.91	>.36

To provide another perspective on the T-test results, an analysis of covariance (general linear models procedure) was run with the pretest score as the covariate and the posttest score as the dependent variable. The difference in mean posttest scores was significant at the .0001 level.

Statistical Reliability and Generalizability of Results

Students selected to participate in the field test were broadly representative of the intended users of the entrepreneurship modules--secondary vocational students. The site selection process utilized by project staff resulted in a diverse sample that varied along the dimensions of geographical location, demographic setting, and institutional type. Field test data were collected at 14 sites across the country that represented the range of educational settings in which intended module users receive instruction. Modules were infused into vocational classes and curricula in a variety of ways at the discretion of the instructors. Treatment student gains were consistent across the 14 sites.

Since the modules were tested on such a representative group of individuals, the results of the field test should be generalizable to the entire target population. Because the field test was conducted under natural conditions representing the wide variety of conditions for which the modules were designed, it is likely that the results reported are not limited to the field test.

Evidence That Effects Are Attributable to the Intervention

Treatment and control group students who provided data for the comparisons reported earlier were quite similar.

Control groups were selected with the stipulation that they be made up of persons essentially similar to the treatment students. Following is the instruction given to local site coordinators: "Members of both the experimental group and the control group should be generally representative of the modules' intended audience (students enrolled in vocational courses), and the groups should be basically alike in age, background, ability, and education." Treatment and control students at each site attended the same type of institution. In 13 of the 14 sites, treatment and control students attended the same type of classes (technical skills training or cooperative education).

Data collected during the field test reinforce the assertion that the treatment and control groups were drawn from the same population. The means of the ages of individuals in the two groups differed by only about 1 1/2 months. A difference of this size is unlikely to have had any effect on field test results. The percentages of representatives of the two sexes did not differ significantly between the two groups ($p=.2$ by chi square). And finally, the means of the pretest scores of students in the two groups did not differ significantly.

Practice effects, maturation, and intervening external influences are not likely to account for the statistically significant difference in the two groups' posttest scores, either. At each site, treatment and control groups were tested at about the same times. The effects, if any, of potentially biasing factors would be the same for each group of students. These factors could not bias field test results in favor of module effectiveness.

Educational Signficance of Results

Importance of treatment. The results of the field test demonstrated that study of the entrepreneurship core module and one business-specific module (related to a student's area of vocational study) increases students' knowledge of the skills necessary to start and operate a small business successfully. These skills are especially valuable because the number of vocational graduates who immediately become entrepreneurs is in the thousands and is growing annually. However, without entrepreneurship training, their businesses are apt to become a statistic in the small business failure rate (80% over five years). The entrepreneurship modules are the only materials to date that have been developed for use by secondary students in a classroom setting to learn about entrepreneurship on both a general and a business-specific basis.

Amount of treatment gain. The educational significance of the increase in students' knowledge of entrepreneurial skills is demonstrated by comparing the gain in mean scores from pretest to posttest of students who studied the modules with the standard deviation of their scores. This gain exceeded one-half the standard deviation. To put this comparison in perspective, Tallmadge reported, in The Joint Dissemination Review Panel Ideabook,* that a gain of one-third, but at times as little as one-fourth, a standard deviation is considered to be educationally significant.

Cost-effectiveness and practicality of treatment. A major factor in the educational significance of the entrepreneurship modules is practical rather than statistical. The real significance of the field test results stems from the fact that the modules are low in cost and can be

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* Tallmadge, G. K. The Joint Dissemination Review Panel Ideabook. Washington, D.C.: U.S. Department of Health, Education, and Welfare, 1977, p. 34.

easily infused into existing vocational programs with a minimum of disruption. The modules can be implemented at the cost of $4 per student per semester. Entrepreneurship instruction is an area of high current interest to vocational instructors, as demonstrated by the fact that all field test sites participated in the project on a voluntary basis. Furthermore, teachers who used the modules in their classrooms reported on a questionnaire that they considered the modules to be generally valuable and easy to use and that they would recommend using the modules to other teachers.